A6 Clean Energy and Greenhouse Gas Technologies

Batch Adsorber based PSA Model for Rapid and Efficient Screening of Adsorbents in Post-Combustion CO2 Capture

Wed, October 31 | Grand Ballroom Centre | Oral

Part of:
Clean Energy and Greenhouse Gas Technologies (GHG Mitigation and CO2 Capture, Utilization, and Storage) - Wed PM3

Info

Symposia/Special Sessions/Technical Tracks/Student Competition:
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Oral or Poster presentation:
Oral

Abstract:
The adsorption-based CO_2 capture has shown promising potential overcoming the limitations posed by commercialised solvent amine-based systems. The choice of an adsorbent is critical to the design of pressure swing adsorption (PSA) processes. Since adsorption processes are cyclic, their design and optimization are computationally challenging. Hence, simple models that capture the essential process characteristics are required for rapid screening of adsorbents. The objective of this work is to come up with a simplified process design model for PSA process which could reliably screen the adsorbents at a faster rate. The model considers only a batch adsorber thereby significantly reducing the complexity, allowing for rapid computation. The model is used to estimate CO_2 purity, recovery and energy consumption. The model results are compared with detailed process optimizations to develop a classification metric to identify adsorbents that satisfy U. S. Department of Energy's requirement for CO_2 capture processes. The model is then used to screen favourable adsorbents from a set of 100+ real and hypothetical adsorbents. The results indicate that the batch adsorber model can be used for screening a large database of adsorbents in a fast and efficient manner.

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